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NOVEL MODELS FOR CREDIT CARD FRAUD DETECTION

Abstract

Financial institutions attach great importance to credit card fraud detection, as a natural consequence of the multi-billion dollar annual losses incurred due to credit card fraud. Rule based systems have been commonly used by financial institutions to detect credit card fraud. The rules applied in such systems are formulated based on the experience of fraud experts and the results of fraud investigations. Rule discovery is a manual process, and this fact is an important disadvantage of rule-based systems. Unlike rule-based systems, artificial intelligence models are expected to learn from past transaction data and consequently no manual process is necessary. Many researchers in the domain of credit card fraud detection have recognized this advantage offered by artificial intelligence models. In this thesis, we propose novel artificial intelligence based models for detecting credit card fraud. First, we propose Cardholder Behavior Model (CBM). CBM is an unsupervised model and uses clustering transaction amounts to represent the spending behavior of cardholders. We propose four focal points to fine-tune CBM, which are single-card versus multi-card focus, holiday season spending focus, time of day focus and inflation focus. The second model we propose is called Optimistic, Pessimistic and Weighted Voting in an Ensemble of Models (OPWEM). OPWEM is an ensemble of six well known artificial intelligence techniques, namely Decision Tree, Random Forest, Bayesian Network, Naïve Bayes, Support Vector Machine, and K*. We propose optimistic, pessimistic and weighted voting strategies in OPWEM for better detection of credit card fraud. The third model we propose is called Spending Behavior Similarity Model (SBSM). SBSM uses spending behavior similarity measures in order to improve the performance of supervised models. A dataset of real-life credit card transactions from a leading bank in Turkey has been used to evaluate the performance of three proposed models. Finally, we provide a comparative evaluation of three proposed models.

PUBLICATIONS

Journals

1. Kultur, Y., Çağlayan, M.U., “Hybrid approaches for detecting credit card fraud”, in Expert Systems, vol. 34, no. 2, April 2017. (SCI-E)
2. Kultur, Y., Çağlayan M.U., “A novel cardholder behavior model for detecting credit card fraud”, in Intelligent Automation & Soft Computing, July 2017. (SCI-E)
3. Kultur, Y., Çağlayan, M.U., “SBS: Using Spending Behaviour Similarity to Improve Credit Card Fraud Detection”, in International Journal on Artificial Intelligence Tools, *submitted*. (SCI-E)

Conferences

1. Kultur, Y., Çağlayan, M.U., “A novel cardholder behavior model for detecting credit card fraud”, Proceedings of the 9th international conference on application of information and communication technologies (AICT), pp. 148-152, Rostov-on-Don, Russia, 2015.

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